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Every operator in the factory who has charge of a machine, be it a milling-machine or drill-press, a lathe or planer, has a certain and absolute direct and instantaneous control over the automatic valve-gear on the engine in the basement, through the medium of the belt-shifter on his machine. Suppose he is using a milling-machine. The piece being milled has finished its travel, and the machine is stopped by shifting the belt on to a loose pulley. A horse-power of duty has been taken off of the electric motor driving that machine: the tension on the motor belt relaxes to exactly that extent; the counter electro motive force in the armature of the motor instantly increases; and the horse-power of current, which is no longer called for in the motor, the dynamo in the engine-room ceases to generate; and the automatic valve-gear on the engine immediately adjusts itself to a shorter cut-off.

Another great feature in this method of factory construction is the independence of each department. A break-down in one, or a stoppage from any cause, has no effect on the other departments. Each floor is connected directly to the engine-room.

The accompanying illustration (Fig. 1) shows the improved form of motor now manufactured by the company. The motor is wound for 110 volt constant potential circuits, and is started by simply turning on the switch fastened to the front of the yoke, and stopped by turning it back again. The mechanical construction of these motors is excellent, the machine being interchangeable in every part. Every hole in each part of the machine is so drilled, even in the large bed-plate, that it is impossible for the workman to get a hole a hundredth of an inch out of the way; so that, when the machines are assembled, it is only necessary to take each piece indiscriminately out of a pile of finished parts, and bolt them together.

CONVENTION OF THE NATIONAL ELECTRIC LIGHT ASSOCIATION.

THE ninth semi-annual convention of the National Electric Light Association was held at the Exposition building, Chicago, Feb. 19-21. The attendance was large, the electric light and power interests of all parts of the country being well represented. A large number of electrical exhibits, including all kinds of electric light and motor apparatus, from insulating tape to an electric street-car in operation, added much to the interest and importance of the occasion. The building was, as might naturally be expected, handsomely decorated, and brilliantly illuminated, when necessary, by numerous constellations of incandescent lamps, many of them being effectively grouped in ornamental designs.

On Tuesday, the 19th, the convention was called to order by the president of the association, S. A. Duncan, who introduced the city electrician, Professor Barrett, representing the mayor of the city, who was unavoidably absent. It may be mentioned here, incidentally, that a city electrician is an official undreamed of until recently, when electric light and power matters have assumed an importance approaching that of the water-supply or public works department.

After the usual courtesies of the city had been extended to the members of the association by Professor Barrett in the name of the mayor, President Duncan, after duly acknowledging the hospitalities tendered by the authorities, delivered the opening address, a brief abstract of which we give. Mr. Duncan said, in effect, —

“But few of the gentlemen of this country who are commercially connected with the manufacture and distribution of electric light and power are aware that five years ago this month a handful of men met in Chicago, and organized a movement which has grown into the organization which is in session at the present time. The industry of electric lighting at that time was carried on with all the enthusiasm which comes with a new undertaking, and with the mistakes which are sure to arise in the commercial introduction of any great industrial agency. The gentlemen engaged therein, strangers to one another, working independently, with no attempt at harmony, with but little knowledge of one another's methods of business, with no established custom or precedent to guide them, came together for the purpose of deriving those benefits which invariably result from the deliberate discussion of those questions which are common to the experience of all electric-light men. To

even enumerate the topics which have been discussed at the various conventions of this association would consume more time than your president feels at liberty to take. Fortunately, the association is in possession of a complete set of published proceedings, and these volumes testify to the steady and rapid growth of the industry, and the increased information on the part of the whole electrical fraternity on the general subject of electric light and power.

“In the early days of this association the chief question was the question of arc lighting. The incandescent light had scarcely come into commercial use. No sooner had the questions involved in arc lighting been solved than the complicated questions involved in the distribution of incandescent lighting absorbed the attention of the fraternity. Following closely upon the problems involved in incandescent lighting came the question of electrical distribution of power, first for stationary motor purposes, and afterward for the purpose of electrical locomotion. This question is, perhaps, the most important one before us. To say that electrical power is not a success would be to reflect upon the scores of electrical railways in successful operation in this country, and upon the thousands of electrical motors that are commercially serving the wants of man.

“We may here profitably consider some figures indicating the growth of the electric lighting and power industry, the increase in the number of central stations, arc and incandescent lamps, electric motors and electric railways, now in operation. At the meeting of this association one year ago, it was estimated that there were not less than 4,000 central-station and isolated plants in operation in the United States: the number of central-station and isolated plants at the present time is 5,747. This shows an increase during the year of 2,067 plants, or, in other words, of 45.8 per cent. A year ago there were 175,000 arc lamps in daily use in the United States: at present there are 219,924, — an increase of 62,625, or a total gain of arc lamps for the year of 34.3 per cent. A year ago there were 1,750,000 incandescent lamps in use in the United States: at the present time there are no less than 2,504,490, making a gain of 754,990 incandescent lamps, — 49 per cent increase. The increase in capitalization in electric-light companies of the United States during the year has been \$69,397,734.

“It is interesting to note some comparative figures upon the electric-railway industry. Six months ago there were 34 electric railroads in operation in the United States: during the last six months there has been an increase of 19, making at the present time a total of 53. Six months ago there were 83 roads in process of construction: there are 39 less at the present time, making the number of roads now under construction, not finished, 44. Six months ago there were 39 electric roads incorporated in the United States upon which construction had not yet begun: at the present time there are 42. Six months ago there were 225 electric cars in operation: since that time, 155 have been put into commission, making, at the present time, 379 cars in operation. Six months ago there were 244 cars under contract, but not in operation: this number has increased by 185 during the last six months, making a total of 339 electric cars at present under contract, but not running. Six months ago there were 138 miles of single track in operation: during the past six months there has been an increase of 157.5 miles, making a total at the present time of 294.5 miles of single track in operation. Six months ago there were 189.5 miles of single track under contract, but not in operation: at the present time there are 273.75 miles of single track under contract, but not in operation. It would be profitless to draw elaborate deductions from these figures: they tell for themselves the story of prosperity and rapid growth throughout every department of the electric light and power industry.

“We are gathered not only for the purpose of seeing an exhibit of the latest forms of electrical apparatus and supplies, but primarily for the purpose of listening to papers and discussions upon all important electrical questions. Some of the subjects deserve special mention. Petroleum for fuel first received attention from this body at its last meeting. At this meeting several papers will be presented upon the subject. The question of the materials of underground conduits in relation to the insulating materials of cables will also be treated. The question of static charge on un-

derground cables, and the attendant puncturing thereof, will also be the theme of a paper. Electric-light stations as fire risks will be treated by an expert in fire underwriting, who has given especial time and attention to that branch of the subject. Municipal lighting will be the subject of one or two papers, and no doubt of a profitable discussion. The committee on underground conduits and conductors has carried on a correspondence with the electric-lighting fraternity, and it seems proper that the information gathered should be presented in Chicago, where the undergrounding of electric-lighting wires has been more practically carried out than perhaps in any other city in the world. This question, which is at present one in which diverse opinions are held by men of equal professional standing, is one which this association cannot afford at the present time to ignore or overlook."

After some routine business, came the report of the committee on patent legislation, which shows that much progress has been made in the direction of securing the establishment of a court of patent appeals. This court is to consist of three justices, appointed by the President, with the advice and consent of the Senate, to have appellate jurisdiction in cases touching patents, copyrights, trademarks, and labels. "The expediency and propriety of, if not the necessity for, the establishment of such a court as contemplated by this measure," to use the language of the committee's report, "will not be questioned if proper consideration be given to the objects that will be attained by the passage of this bill."

It is claimed that such a court would enable the public and patentees to determine the value and validity of patents without serious and vexatious delays; that it would relieve the Supreme Court of much of the burden imposed upon it by this class of litigation; that practice in the patent office would become thoroughly fixed and understood, and the issue of worthless patents would be greatly diminished, if not entirely suppressed; and that it would tend to simplify the patent laws by construction, and settle questions of doubt which are often used by litigants for the purpose of injustice and oppression. Under the present condition of the business of the courts, it requires ordinarily from two to three years to obtain a decision in the circuit courts of the United States, and, if appealed to the Supreme Court, from three to four years are required to obtain a decision. The same difficulty and delay attend the determination of all other questions involving the determination of property rights. While this is true, it should be borne in mind that this species or character of property differs from all other kinds of property. The duration of the owner's title is arbitrarily fixed by law. The period is short, for the most part seventeen years. The Constitution imposes upon Congress the duty of securing to authors and inventors, for a limited time, the exclusive right to their respective writings and inventions. This duty is very imperfectly discharged, when, by the omission of Congress to provide proper means to determine questions arising out of patents, the life of a patent may be frittered away by the delays of the law.

The committee on insulation of wires and installation of plants being called upon for a report, it was shown that the duties of that committee were of such a character that no one engaged in the electric-lighting business would care to attempt to fulfil them: consequently there was no report to make, and the committee was accordingly discharged; as was also the committee on electrical education, which reported that Columbia College of New York had so effectively taken up the work of the committee as to render its further services unnecessary.

At the opening of the session of Wednesday, after the usual preliminary business was disposed of, the report of the underground committee was read. It contained a large number of answers to a circular issued by the committee relative to the operation of underground wires. The report was discussed by Professor Barrett, who said the underground problem was solved successfully in Chicago. Mr. W. H. Johnstone discussed the paper at length, and gave the results of experience with his own conduit, which has been laid in Philadelphia and New York. Mr. T. Carpenter Smith said that overhead wires, when well constructed, were the safest method of distribution. Mr. De Camp spoke of the non-success of running arc-light wires under ground in Philadelphia, and was joined therein by Mr. Charles Cooper and others. Mr. B. E. Sunny said that technically his underground arc wires

were successful, but their cost was very high, the expense of maintenance amounting to one cent per lamp per hour during an experience of ninety days.

The discussion induced by this report was exceedingly interesting, and made prominent the fact that many difficult problems relating to the transmission under ground of high-tension electric currents yet remain to be solved.

On Thursday, the last day of the convention, a resolution was adopted to the effect that the report of the committee on underground wires be recommitted, and three new members were added to the committee. This committee, the result of whose labors during the next half-year will be awaited with great interest, now consists of Messrs. Lynch, Barney, Kerr, Davis, Crocker, Sperry, Barrett, and Sunny.

A resolution was unanimously adopted by the association to the effect that the members of that body would decline to allow any electric current under their control to be used for the purpose of inflicting the death-penalty upon condemned criminals.

In the afternoon session the committee on insurance exchange made a report, describing the work accomplished by the New England Electric Exchange in the licensing of persons installing and operating electric-light plants, and recommending the organization of similar exchanges in every State.

Niagara Falls was selected as the next meeting-place of the association, the date to be determined by the executive committee; and the following officers were elected for the ensuing year: president, E. R. Weeks of Kansas City; first vice-president, A. J. De Camp of Philadelphia; second vice-president, E. A. Maher of Albany, N.Y.; executive committee, B. Rhodes of Niagara Falls, B. E. Sunny of Chicago, C. R. Huntley of Buffalo, Dr. O. A. Moses of New York, E. T. Lynch, jun., of Brooklyn, P. H. Alexander of New York, J. F. Morrison of Baltimore, and T. Carpenter Smith of Philadelphia.

Among the papers read at the convention were one by Mr. S. E. Barton, on "Electric Light Stations as Fire Risks," which was discussed by Messrs. Morrison, Alexander, and others; one by Mr. C. H. Rudd, entitled "Disruptive Discharges in Lead Cables," discussed by Messrs. Barrett, Lockwood, and Acheson; one by Mr. S. S. Leonard, on "Petroleum Fuel;" one by M. J. Francisco, on "Liquid Fuel;" and one treating of the "Advantages of Oil for Fuel," by Col. C. M. Ransom. The discussion of these latter papers was participated in by Messrs. Leonard, Lockwood, Ransom, and Francisco. Papers were also read by Mr. F. H. Whipple, on "Municipal Lighting," and by Mr. A. R. Foote, on "Public Ownership of Commercial Monopolies."

The interesting report of the committee on underground conduits and conductors excited a somewhat lively discussion, which was ably carried on by many of the members present. The further report of this committee at the next convention will be awaited with much interest, as the subject of putting electric-light wires under ground in our large cities has assumed great importance.

A party of sixty gentlemen, mostly electricians, visited the convention by special train from this city. The train consisted of three Pullman vestibule cars, a dining-car, and a combination car with bath-room and barber-shop. It was lighted throughout by electricity furnished by an Eickemeyer dynamo driven by a Brotherhood engine.

On the afternoon of Wednesday, after adjournment, a party of delegates and visitors to the convention paid a visit, by invitation, to inspect an installation of accumulators recently placed in the residence of Potter Palmer by the Electric Accumulator Company. The current is generated by one of the United States Company's dynamos driven by an Otto gas-engine. The plant works admirably, giving great satisfaction to Mr. Palmer as well as to the company which supplied it.

HARWOOD'S NITROUS-OXIDE BLOW-PIPE.

A SIMPLE and convenient form of compound blow-pipe, invented by Dr. G. F. Harwood of Worcester, Mass., is shown in the accompanying engraving. It is intended for use in scientific laboratories, technical schools, dental offices, and other places where a powerful and concentrated flame under perfect control is required.